

## CONTRIBUTORS TO THIS ISSUE

**R. L. Adams**, BSEE, 1967, Purdue University; MSEE, 1969, Massachusetts Institute of Technology; Bell Laboratories, 1967—. Mr. Adams has been involved with the reduced sensitivity active filter design and computer-assisted inductor-capacitor (LC) filter tuning. In 1975 he became Supervisor of a group that designed thin-film RC active filters, passive LC filters, and crystal filters. Presently, he is Supervisor of a group concerned with adaptive systems, switched-capacitor networks, and telecommunications applications of very large-scale integration (VLSI).

**W. G. Albert**, Bell Laboratories, 1951—. Mr. Albert was initially engaged in the physical design of terminal equipment for the L3 Coaxial System. He also worked on the design of the A4 and A5 channel banks, L multiplex, Mastergroup Multiplex, and L4 and L5 Coaxial Line Repeaters. He is now Supervisor of the Digital Banks Physical Design Group responsible for the design of D5 digital banks, PSDC, and No. 5 ESS Trunk Unit. Mr. Albert was awarded a patent for electrical connectors for coaxial cables. Member, IEEE.

**Paul G. St. Amand**, B.S.E.E., 1969, Tufts University; M.S.E.E., 1970, Stanford University; Bell Laboratories, 1969—. Mr. St. Amand has worked on digital control circuits for the L5 and L5E coaxial cable systems. He has worked on system design and large-scale integration (LSI) implementation for D4 dataports. Since 1979, he has been a Supervisor working in exploratory channel bank studies. Member, IEEE, Tau Beta Pi, Eta Kappa Nu.

**Thomas J. Aprille**, B.S. (Electrical Engineering), 1967, Northeastern University, Boston, MA; M.S. and Ph.D. degrees (Electrical Engineering), 1968 and 1972, respectively, University of Illinois, Urbana; Magnavox Company, 1968–1970; Bell Laboratories, 1972—. From 1968 to 1970 Mr. Aprille worked in the Data Products Group of the Magnavox Company, Urbana, Illinois. Since 1972 he has been with Bell Laboratories at Merrimack Valley, where he is presently Supervisor of the Digital Transmission Technology group. In 1971, Mr. Aprille received the Best Paper Award from the Asilomar Conference on Circuits and Systems and in 1976 he received the Guillemin-Cauer Award from the IEEE Circuits and Systems Society. Since 1980 he has been an Associate Technical Editor for IEEE Communications Magazine and since 1981 an Associate Editor for the IEEE Transactions on Communications. Member, Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi, Sigma Xi, and senior member, IEEE.

**Robert E. Benjamin**, Bell Laboratories, 1959—. Mr. Benjamin has participated in the modernization of six multiplex systems. He also worked on the Bell System Reference Frequency Network circuits until the emphasis was changed from coaxial systems to digital systems. His first assignment in digital systems was the D4 Maintenance Bank design. Mr. Benjamin is a member of No. 5 ESS Trunk Unit and D5 Controller Group at Bell Laboratories, Merrimack Valley, where he is working on trunk circuits for No. 5 ESS.

**Jess Chernak**, B.E.E., 1960, Polytechnic Institute of Brooklyn; M.E.E., 1961, New York University; Bell Laboratories, 1960—. Mr. Chernak joined Bell Labs in 1960 and initially was active in exploring the use of computers for designing transmission systems. He was promoted to Supervisor in 1963, responsible for work on such applications of computers. Five years later, he was made Head of the Computer-Aided Analysis Department. In 1970 he was appointed Director of the Transmission Technology Laboratory, responsible for the design of equipment used in transmission systems, including magnetic components and microwave filters. In 1975 he became Director of the Digital Transmission Laboratory, Merrimack Valley, where he was responsible for all aspects of digital transmission in the exchange area. Mr. Chernak was appointed Executive Director of the Loop Transmission Division of Bell Laboratories in Whippany, N. J., in July 1979. In this position he is responsible for systems engineering and development of the communications network where it connects to Bell customers, including cables, electronics, installation protection, and maintenance systems. He has published a number of articles on computer-aided design. Senior Member, IEEE; member, Eta Kappa Nu and Tau Beta Pi honor societies.

**Yo-Sung Cho**, B.S.E.E., 1962, Seoul National University, Korea; M.S., 1966, and Ph.D., 1968, Yale University; Honeywell EDP Division, 1967-1969; Bell Laboratories, 1969-1981; AT&T International, 1981—. At Bell Laboratories, Mr. Cho was engaged in developing equalizers and exploratory repeater amplifiers for coaxial cable transmission systems. Subsequently, he supervised various groups responsible for developing multiplexing equipment for coaxial and radio systems, digital channel banks for subscriber loop, and other applications. He is currently a Division Manager of AT&T International, responsible for the company's systems engineering activity. Member, IEEE.

**C. R. Crue**, ASEE, 1959, Wentworth Institute, Boston, MA; BSEE, 1965, Newark College of Engineering, Newark NJ; MSEE, 1971, North-

eastern University, Boston, MA; Bell Laboratories, 1959—. Except for approximately one year (1969–70) when he worked for Acton Laboratories, Mr. Crue has been with Bell Laboratories involved in a wide variety of projects. These range from guided wave and digital techniques research to L4 and L5 long-haul carrier systems and digital channel banks. He is presently doing design development work for a switched alternate voice-data transmission system. Mr. Crue holds two patents.

**Bruce J. Dunbar**, B.S. (Electrical Engineering), 1978, Lehigh University; M.S. (Electrical Engineering), 1979, Stanford University; Bell of Pennsylvania, 1977; Bell Laboratories, 1978—. As a member of the Digital Transmission Laboratory, Mr. Dunbar has been involved in the development of digital channel banks, with emphasis on devices and subsystems to serve digital data customers. Member, Phi Beta Kappa, Tau Beta Pi, Eta Kappa Nu, IEEE.

**Anthony G. Favale**, Bell Laboratories, 1956—. Mr. Favale was initially engaged in the Physical Design of the A5 channel bank. He also worked on the physical design and development of L Multiplex, L4 and L5 Coaxial Systems, and the D4 channel bank. He was awarded a U. S. Patent in 1978 for a "Jumper Plug and Socket" used in D4, and is presently involved in the physical design of the D5 channel bank.

**John S. Fisher**, B.A. (Physics), 1952, University of Wichita; M.A. (Physics), 1954, University of Kansas; Bell Laboratories, 1957—. At Bell Laboratories Mr. Fisher originally worked on process development of tantalum solid electrolytic capacitors. After becoming a Supervisor he has worked on the development of tantalum thin-film hybrid integrated circuits, and most recently in failure-mode analysis and the reliability of hybrid integrated circuits.

**W. B. Gaunt, Jr.**, B.E.E., 1949, M.S.E.E., 1958, Polytechnic Institute of New York; Bell Laboratories, 1957—. Mr. Gaunt is currently supervising the D5 Channel Units Group of the Digital Transmission Laboratory at Merrimack Valley. This group is responsible for the development of channel interface circuits for new generation PCM terminals. Mr. Gaunt initially worked on development of magnetic core access switches and twistor stores. Later, he was involved in various aspects of time-division switching for No. 101 ESS and integrated circuitry design for the T1 carrier system. His T-carrier work includes design and development of hybrid integrated circuits for the D3 channel bank common circuits, and development of the D1D channel bank. From 1974 to 1978 he was also responsible for the initial

planning and common circuits development of the D4E (CCITT-compatible) PCM channel bank—a "D4 technology" derivative. Mr. Gaunt holds 26 patents. Member IEEE, Eta Kappa Nu, and Tau Beta Pi.

**Richard M. Goldstein**, B. S., 1963, M.A., 1966, Sc.D., 1970, Washington University; McDonnell Douglas, 1963—1970; Bell Laboratories, 1970—. Mr. Goldstein worked in the Research Division of McDonnell Douglas, where he fabricated and studied thin-film microelectronic components. At Bell Laboratories he has worked on magnetic bubbles and has spent the last ten years in the custom MOS integrated circuit design area. In 1978, he was appointed Supervisor of a group responsible for polycell design and generation. In 1980, he was given a group responsible for the design of custom MOS chips. Mr. Goldstein has 20 publications and one patent to his credit.

**John H. Green**, BSEE, 1966 and MSEE, 1968, Northeastern University; Bell Laboratories, 1966—. Mr. Green has been involved in the development of frequency division multiplex transmission systems, and, more recently, pulse code modulation transmission systems. He currently supervises a group that is responsible for system testing of digital transmission systems.

**Dev Vrat Gupta**, B. Tech. (Hons.), (Electrical Engineering), 1974, Indian Institute of Technology, Kanpur; M.S.E.E., 1975, University of Maine at Orono; Ph.D. (Electrical Engineering), 1977, University of Massachusetts, Amherst; Bell Laboratories, 1977—. After joining Bell Labs Mr. Gupta worked in the area of digital transmission, with responsibility for providing reliable data transmission over voice-grade T-carrier facilities terminating in D3 and D4 channel banks. His next assignment involved the architectural design of the multiple microprocessor-controlled D5 channel bank, where he was responsible for the architectural design of maintenance, testing and automatic diagnostics for channel units. Mr. Gupta is currently Supervisor of the Functional terminal Circuits Group. He is responsible for the design of intelligent, modular hardware that can be attached to an intelligent telephone to provide extra services. He also supervises the design of voice and data communication systems that interconnect these intelligent terminal stations into a network within the customer premises.

**James R. Hall**, A.S.E.Sc., 1967, Broome Technical Community College; B.S.M.E., 1970, New Mexico State University; M.S.M.E., 1971, University of Illinois; Bell Laboratories, 1970—. Mr. Hall was initially

engaged in thermal analysis of the L5 system. He was subsequently responsible for the physical design of the Mastergroup Translator and more recently the *SLC*<sup>TM</sup>-96 digital banks. He is currently involved in the development of a high-frequency lightguide system.

**Mark P. Horvath**, B.S.E.E., 1977, West Virginia University; M.S. (Electrical & Computer Engineering), 1979, University of Michigan; Bell Laboratories, 1977—. Since joining Bell Laboratories Mr. Horvath has worked with error simulation in digital voice transmission, the development of a device for use with the Digital Data System, and a study of certain customer access methods for the Advanced Communication Service (ACS). His present work is in the development of hardware architectures to implement link-level protocols within ACS. He is presently a member of the Data Network Exploratory Development Department. Member, Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi, IEEE.

**Dennis H. Klockow**, B.S.E.E., 1959, University of Wisconsin; M.S.E.E., 1961, Northeastern University; Bell Laboratories, 1959—. Mr. Klockow is Supervisor of an Advanced Hybrid Design and Technology Group responsible for the design of custom hybrid integrated circuits for transmission applications. Member, Eta Kappa Nu, Tau Beta Pi, IEEE, ISHM.

**Joseph E. Landry**, A.A.S. (Electronic Engineering Technology), 1966, Wentworth Institute, Boston, MA; Bell Laboratories, 1966—. Mr. Landry has been involved in the designs of D3, D4, D4E, and D5 Digital Systems as a system designer, board designer, and chip designer. He holds three patents.

**Joseph J. Lang**, B.S., 1956, University of Illinois, M.S., 1957, Stanford University, Ph.D., 1961, Michigan State University, all in Electrical Engineering; Bell Laboratories, 1961—. Mr. Lang joined Bell Laboratories in 1961 and worked on applications of network theory and computer-aided analysis to the design of networks and systems. He later led a group responsible for analog computer simulation of networks and systems. In 1966, he became Head of a department responsible for the design and development of active networks for use in transmission systems. In 1968, he assumed responsibility for the development of long-haul coaxial transmission systems and broadband multiplex equipment, and from 1976 till 1979, he headed the Digital Systems Department. In 1979 Mr. Lang was appointed Director of the Digital Transmission Laboratory at Merrimack Valley. In this position, he is responsible for the design and development of digital transmission

systems. Senior member, IEEE; member, Phi Kappa Phi, Tau Beta Pi, Eta Kappa Nu; associate member, Sigma Xi.

**John D. Leggett**, BSEE, 1963, Princeton University; M.S., 1965, Ph. D., 1968, University of Pennsylvania; Bell Laboratories, 1968-1982. Mr. Leggett developed techniques for computer circuit simulation, and was responsible for custom integrated circuit design for switching and transmission equipment. In 1977, he was appointed Supervisor of a group responsible for gate array design. Member, Sigma Xi.

**H. H. Mahn**, Bell Laboratories, 1959—. Mr. Mahn first worked on microwave radio systems. He has been involved with radio protection switching systems, as well as the C1, D2, and E-type alarm and control systems. Mr. Mahn is a member of the Digital Data Transmission and Services Department, where he is presently working on the D4 and Digital Carrier Trunk Maintenance Banks, as well as other supporting equipment for D3 and D4 digital channel banks.

**Gilbert L. Mowery**, S.B., 1965, Massachusetts Institute of Technology; M.S., 1966, and Ph.D., 1970, Carnegie-Mellon University, all in Electrical Engineering; Bell Laboratories, 1970—. Mr. Mowery joined Bell Laboratories in 1970, working on mos integrated circuits. Currently, he is Supervisor of the mos Circuits Group, responsible for the design of numerous LSI custom logic ICS.

**Sundaram Narayanan**, B.S.E.E., 1960, India Institute of Technology, Khasagpur, India; Ph.D. (Electrical Engineering), 1965, Carnegie-Mellon University, Pittsburgh, PA; Bell Laboratories, 1965—. Mr. Narayanan joined Bell Laboratories in 1965 and worked in the Coaxial System Studies group on nonlinear distortion mechanisms in transistorized feedback amplifiers. In 1970, he became Supervisor of L5 Jumbo Group Frequency Supply. He has subsequently supervised groups responsible for multimastergroup translator and dataports for D3 and D4 channel banks. Mr. Narayanan is now Head of the Components and Subsystems Department at Bell Laboratories at Merrimack Valley. This department is responsible for magnetic component development and subsystem design using digital signal processing and very large-scale integration (VLSI) technology. Member, Sigma Xi.

**John W. Olson**, B.S.E.E., 1957, Michigan Technological University; M.E.E., 1959, New York University; Bell Laboratories, 1957—. Mr. Olson designed special-purpose digital processors associated with radar detection and data processing. From 1963-1974 he supervised groups

responsible for developing multiprocessor computers for real-time radar data processing. Since 1974, Mr. Olson has supervised groups responsible for developing digital loop carrier systems. Member, Eta Kappa Nu, Phi Kappa Phi, IEEE.

**Owe G. Petersen**, BSEE, 1963, University of Wisconsin; MSEE, 1965, Ph.D., 1971, University of Pennsylvania; Bell Laboratories, 1963—. In his early work Mr. Petersen was engaged in high-frequency semiconductor device development, including p-i-n, varactor, step-recovery, and Schottky diodes. Since 1976 he has been involved in integrated circuit process and circuit development. Member, Tau Beta Pi, Eta Kappa Nu.

**Irving G. Post**, B.S., (Electrical Engineering and Physics), 1958, Lafayette College; M.S. (Physics), 1959, Ph.D. (Physics), 1962, Ohio State University; Bell Laboratories, 1963—. Mr. Post was involved in the development of high-frequency semiconductor devices including Schottky diodes, microwave transistors and high-frequency linear power transistors. Since 1977 he has been working on bipolar integrated circuit designs for custom applications. Member, IEEE, Tau Beta Pi.

**Robert E. Sheehy**, Assoc. E.E., 1960, Wentworth Institute, Boston, MA; Bell Laboratories, 1970—. Mr. Sheehy has worked in the development of electrical networks for radio relay and coaxial carrier systems. His present responsibilities include the realization of analog networks for data transmission using hybrid integrated circuit technology.

**Kenneth F. Sodomsy**, B.S., (Engineering Physics), 1956, University of Manitoba, Canada; Ph.D., (Electrical Engineering), 1959, University of London, England; Bell Laboratories, 1960—. Mr. Sodomsy initially worked on the development of microwave devices and microwave integrated circuits. Since 1974 he has been supervising a group developing Complementary Bipolar Integrated Circuit (CBIC) technology and designing integrated circuits in that technology for a wide variety of system applications. Member, IEEE.

**D. Alan Spires**, B.S.E.E., University of Pittsburgh, Pittsburgh, PA, 1968; M.S.E.E., Massachusetts Institute of Technology, Cambridge, MA, 1970; Bell Laboratories, 1968—. Except for two years in the U.S. Army, Mr. Spires has been employed at Bell Laboratories, North Andover, MA, since 1968, where he has been involved in the system

and circuit design of digital transmission equipment. During these years he has worked on a variety of digital terminals such as the D3, D1D, and D4 PCM channel banks. He is presently involved in the design of trunk and subscriber line interface circuits for digital terminal equipment.

**Shiv Verma, B.S.E.E. (Hons.),** 1964, University of Jabalpur, India; M.S. Tech. (Electrical Engineering and Computer Science), 1966, Indian Institute of Technology; Ph.D. (Electrical Engineering), 1972, University of Illinois; Tuta Institute of Fundamental Research, Bombay, India, 1965-66; Department of Electrical Engineering, H. B. Technological Institute, Kanpur, India, 1966-68; Department of Computer Science, University of Illinois, 1966-72; Bell Laboratories, 1972—. While at the Tuta Institute in Bombay, India, Mr. Verma was responsible for the design of parts of a real-time process control computer. He served as the associate head of the Department of Electrical Engineering at the H. B. Technological Institute in Kanpur, India. As a member of the Information Processing Engineering group at the University of Illinois, he developed a computer system for real-time, three-dimensional display applications. After joining Bell Laboratories, Mr. Verma worked on the application of large-scale integrated circuits, microprocessors, and a high-speed digital processor in voice-hand modems, and a time-division multiplexer. He has supervised groups that have developed products for the Automatic Secured Voice Communications II system and the Digital Data System, and also supervised the Digital Signal Processing Group, which is responsible for developing products for customer access to a data network. He is presently head of the Data Network Exploratory Development Department. Member, IEEE.

**Frederick E. Weber, B.S.E.E.,** 1969, Pennsylvania State University; M.S.E.E., 1970, Stanford University; Bell Laboratories, 1969—1975, 1978—. Mr. Weber has worked on circuit design and development of digital carrier transmission systems. After spending 1976-1977 as a member of the engineering staff of Illinois Bell Telephone, he rejoined Bell Laboratories to work on system studies supporting new digital network capabilities. He presently supervises a group planning interface standards for business system products.

**D. H. Williamson, B.S. (Mechanical Engineering),** 1965, University of Kentucky; M.S. (Mechanical Engineering), 1967, Purdue University; Bell Laboratories, 1966—. Mr. Williamson has worked on the physical design of power conditioning systems, including the design of standard integrated circuit control devices and standard families of dc-to-dc



converters. More recently he has supervised physical design groups responsible for the design and development of loop electronics systems. Currently, Mr. Williamson is Head of a department concerned with developing loop distribution apparatus. Member, ASME, Pi Tau Sigma, Tau Beta Pi.

